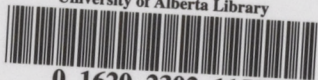


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The Bad Lands

of the

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DRUMHELLER

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"VALLEY OF THE DINOSAURS"

Prepared By
DR. W. R. READ
Drumheller, Alberta

INTRODUCTION.

FOSSILS LIFT THE VEIL OF TIME.

THE CRETACEOUS PERIOD.

GEOLOGY AT DRUMHELLER—

Paskapoo Formation

Edmonton Formation

—Bentonite

Bearpaw Formation

(Belly River Formation).

THE ICE AGES.

EARLY DINOSAUR DISCOVERIES.

THE AGE OF REPTILES.

DINOSAURS.

FLESH-EATING or CARNIVOROUS DINOSAURS.

PLANT-EATING or HERBIVEROUS DINOSAURS.

DUCK-BILL DINOSAURS,

HORNED DINOSAURS,

ARMOURED DINOSAURS.

HOW ARE DINOSAUR SPECIMENS COLLECTED?

WHY STUDY DINOSAURS AND OTHER FOSSILS?

WHAT KILLED THE DINOSAURS?

Approaching Drumheller and the Valley of the Red Deer River, the terrain suddenly changes from the gently rolling prairie to that of a mile wide and four hundred feet deep valley. Arriving from Calgary via number nine highway, the first intimation of this abrupt change occurs at a point ten miles south-west, where the tourist may stop at Horseshoe Canyon viewpoint. Excellent views of the main valley are found along the Dinosaur Trail and from the Club House at the golf course. Everywhere, one is impressed by the multi-coloured, striated terraces, sheer walls and coulees. Far below, the widening and picturesque Red Deer River flows south-eastward to join the South Saskatchewan. The scene before you cannot be duplicated elsewhere in Canada. This is the Valley of the Dinosaurs and the Badlands of Alberta!

What is the geological story of this great chasm—with its long ridges, buttes and knolls, almost devoid of vegetation and carved into intricate and grotesque patterns and formations? To most people 100 years is a long time

(Continued on Following Page)

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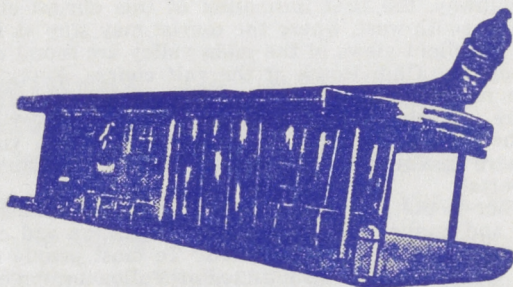
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and "Long ago" may mean from 50 to 5,000 years, but to understand the Badlands story we must think in terms of millions of years. In geological time the valley floor at Drumheller dates back at least 90,000,000 years, and half way up the valley wall to 60,000,000 years ago.

FOSSILS LIFT THE VEIL OF TIME

Life on the earth has passed through many stages between its appearance in the far past and its present day expression. Great races of animals arose, flourished and disappeared, leaving their remains in the rocks as evidence of their existence. These remains, known as fossils, are petrified plant and animal life found buried in the layers of the earth's crust. Although fossil remains were known to exist as early as 450 B.C., for many centuries they were deprecated as devices planted by the devil to delude man. Another conviction grew that they were "relics of that accursed race that perished with the flood." Yet by the turn of the 19th century a few lonely pioneers were chipping away at the hillsides and valleys. They noticed a relation between the separate layers and the fossils they contained. Each level had its own characteristic plant and animal remains. These men began dimly to sense vast vistas of time, punctuated by profound changes of climate, topography and life. Gradually they were able to piece together the petrified shells, bones, sticks and tree trunks into an accurate picture of the scenes of millions of years ago. Today we have the well developed sciences of Geology, the science that investigates the structure of the earth, the successive physical changes it has undergone and the causes which have operated in producing such alterations in the crust of the globe; and Palentology, the branch of geology which deals with fossil remains. The Red Deer Valley area is a veritable storehouse of fossils and is an easily accessible hunting ground for amateur and professional geologists and paleontologists alike. It has a fascinating story to tell to the most uninitiated. A few hours spent in the local museum and along the Dinosaur Trail will provide much food for reflection.

Almost any group of animals or plants furnishes an interesting history, but perhaps the most spectacular is the great division of the reptils known as Dinosaurs. This word is derived from the Greek, meaning "terrible lizard." These creatures appeal to the imagination by their great diversity of size and form. They dominated the earth for about 150,000,000 years, throughout the Mesozoic era which began approximately 200 million years ago and ended about 60 million years ago. It so happens that the Red Deer River in Drumheller and vicinity cuts through a region that was most suitable for the existence of these creatures, and exposes strata that contain bones of Dinosaurs and other plant and animal life that existed during the late Mesozoic era, in a period known as the Cretaceous. In addition to the eroding action of the river over the ages, the constant erosive action of rain, frost and wind have helped to carve out the badlands and expose the ancient fossil-bearing strata. In many places the motorist can step from his car into formations laid down over 60,000,000 years ago.

THE CRETACEOUS PERIOD

During the Cretaceous period the entire prairie region of North America, from the Coast Range to Winnipeg, and from the Gulf of Mexico to the Arctic was a vast, shallow, inland sea measuring 1,000 miles wide and three times as long. The Rocky Mountains were not yet formed and the warm, moisture-laden Pacific winds reached the interior of the continent inducing a luxuriant vegetation. There were ferns, leafy plants, mosses, lycopods (the mightiest trees on earth), fruit-bearing trees and great cone-bearing trees. The sea was shallow and fluctuating; so much so, that its western part became at times brackish or even fresh. In this environment lived the Dinosaurs, browsing the abundant vegetation and probably often wading in the shallow swampy waters. The waters contained seaweeds, fish, including oysters and other shell fish and amphibians and primitive reptiles from which

(Continued on Following Page)

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the Dinosaurs had evolved. Thus Western Canada presented an appearance vastly different from that of today.

The fluctuating level of the inland sea was in part due to a state of unrest in the earth's crust. Early in the Cretaceous period there were already highlands in the west, but the early Cretaceous also saw a colossal folding and upthrusting resulting in the formation of the Rocky Mountains. This was accompanied by intensive volcanic action. The great inland sea gradually retreated, sediments poured eastward from the eroding mountains. The fluctuating water levels and the settling of these sediments, combined with accumulations of vegetation, marine life and volcanic ash deposited layer upon layer of what has come to be known as sedimentary rocks. This, then is the explanation of the striated layers of the valley walls.

From this world of the past certain legacies have survived. The plant and animal life can be studied in petrified form. The rich beds of coal, varying from a few inches to several feet in thickness and the pools of oil were created from the rotted vegetation and organisms that stifled the lowlands and marshes of the great inland sea. Thus Drumheller is indebted to the eras of millions of years ago for its rich coal and petroleum deposits.

GEOLOGY

At Drumheller the lower three-quarters of the valley wall is composed of the Edmonton formation of the Cretaceous period. The upper fourth is known as the Paskapoo formation of the Cenozoic era. Above this again are layers of loosely cemented conglomerate, clay of glacial origin, and gravel, sand and clay of recent origins, sloping gradually upwards to the prairie.

The name "Paskapoo" is the Indian word for Blindman. It was so named because the strata is well exposed along the Blindman River which enters the Red Deer River about six miles north of the city of Red Deer. It consists of fresh water sandstones and shales probably deposited in a vast fresh water lake. It is well exposed in the canyon between Red Deer and Ardley. In the Handhills area it is 300 feet thick. It is the formation appearing in many places as buff coloured, sharply inclined, cliff-like, slopes near the rim of the valley.

The Edmonton formation which at Drumheller forms the greater part of the valley wall varies greatly in composition. It consists of fine grained sandstones, highly calcareous sandstones, sandy and bentonitic shales, bentonite, ironstone bands, carbonaceous shales and coal. The varying constituents in the layers account for the multicolored, striated appearance. At the time it was formed, Dinosaurs flourished in numbers so great that the valley of the Red Deer River has become a classic locality for students of vertebrate paleontology. It extends along the river from below Drumheller to about 25 miles above the city. The term Edmonton was first used in referring to the strata containing coal seams in the general vicinity of the present city of Edmonton.

Bentonite is the prevailing constituent throughout the Edmonton beds. It is a rock made of altered volcanic ash, thus suggesting that products of volcanic eruption fell in enormous quantity in the area. The light grey bands contain large amounts of bentonite. Where the volcanic ash consolidated into a hard layer of rock it is called a tuff. The name bentonite is derived from its occurrence in the Fort Benton area of Montana. It was originally known on the prairies as "Mineral Soap" or "Clay Soap" and used at Hudson's Bay posts to wash blankets. It was also used for whitewashing purposes. Pure bentonite is yellowish green then fresh and white when air dried. It absorbs three times its weight and seven times its volume of water. When finely ground and mixed with water it will remain in colloidal suspension indefinitely. A bed at the mouth of Michichi creek has been developed commercially. This is the Kidd pit. Among the more than 100 commercial uses for bentonite are manufacture of paper, de-inking old newsprint, manufacture of rubber and paint, as a filler in soap and toothpaste, as medi-

(Continued On Page 47)

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THE BADLANDS

By J. MARK F. SMITH

The western areas of North America, reaching well into Alberta, are commonly known as the "Badlands", which name, as used by the early French explorers in their efforts to strike westward, found them very difficult to cross. Today, they appear to have dissected into a maze of hills whose steep sides are cut with innumerable ravines, the result of ages of building up and tearing down of various deposits, traces of which can be detected without too much difficulty.

It is a worthwhile effort to seek some explanation of this varied process of change and formation, which began a mere matter of millions upon millions of years ago.

There was a time, of course, when life was non-existent—there were long periods when land masses again and again rose from the seas, were worn low and were submerged and covered with the wastes of the other lands. How long this state lasted is very much a matter of conjecture as the human mind has no real conception of such a long period. A non-existent life means non-existent fossils upon which to make deductions of pre-historic times. Indeed, it is vastly beyond our powers to realize the duration of the earth in terms of years.

The beginnings of a more definite age of the earth begins with the appearance of life—marine life—very primitive, but life, nevertheless.

From these very early fossil forms we arrive at a quite definite picture of the early geography which tells us that two long narrow seas stretched north to south across our continent. Between them lay a great central land which probably extended as far south as New Orleans. These seas were sinking—shallow sinking troughs, we might say—filling with wastes from the adjacent lands as fast as they subsided. Gradually the general conditions reversed themselves and the land mass in turn became covered by a shallow sea which stretched from the Gulf of Mexico as far north as the Great Lakes. So far as we have any knowledge, no forests covered the mountains, no verdure covered the plains, no animals lived on the land or in the air. However, the sea life took great comparative strides. The fore-runners of our present day oyster, clam, snail appeared, and years later appeared fishes, scorpions and corals. From fossil forms of this period we know that the climate was quite warm and reached well to the Polar regions. Vegetation now began to clothe the lands, marking the beginnings of oil and gas formations. Later still, the vegetation became extensive and luxuriant, which gave birth to our coal deposits.

The shallow inland sea now emerged, and soon bamboo-like forests—forty, fifty, seventy feet high—grew thick and monotonous. It is this period which begins what is referred to as the "Age of Reptiles". We must remember that each change in "progress" as mentioned above took millions of years to bring about, and as era succeeded era, fossils were secreted to lay buried for millions of years before being uncovered.

Further subsidence and further emergence, with the gradual formation
(Continued on Following Page)

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of the mountains, left North America very much as it now stands. The climate still continued to be warm and semi-tropical, and the reptiles and the dinosaurs ruled the lands—living, fighting, dying—their huge skeletons buried under sediments deposited by the drainage systems as left by the constantly changing terrain. This was indeed an age when fossils were formed and preserved for posterity to read.

Later, this was all assaulted by the "Glacier Epoch". Massive glacial sheets covered the whole of Canada and reached far into the United States south of the Great Lakes. Three sheets of glacial origin formed to bring this about, two of which met in what is now the foothill area of Alberta.

Several glacial stages played a part in changing the topography of the land. They advanced and retreated several times, forming the beginnings of what we now call the Badlands. The drainage system suffered changes due to the glacial deposits of boulders and "bergs". Lakes were formed as the ice melted while soils were left striated, scored and ploughed as they advanced. The drainage system since the withdrawal of the sea due to the rising of the land was now a fresh one.

Thus we see that the melting and the retreat of the glaciers and the erosion due to the fresh water rivers and lakes gradually wore down the soft light deposits.

Alberta's climate is relatively dry, particularly in the southern part, vegetation is slight and the deposits are easily carved by wet weather rills of scanty and infrequent rains.

What wonder then, that these comparatively waterless, rugged surfaces contain vast numbers of the remains of the animals of the Tertiary times. The large amount of barren surface exposed makes search for fossils easy and fruitful.

Indeed, Alberta was once the bottom of a shallow sea. It has since become a mecca—frequently visited by scientific collecting expeditions.



The Graveyard of the Behemoths, easily accessible from the City of Drumheller, and not so difficult to travel in as it may look at first glance. This is a view of one section of the Western Wall of the Dinosaur Valley which in some sections looms 300 feet up over the valley floor.

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— Drumheller

DRUMHELLER AND DISTRICT MUSEUM SOCIETY

(Incorporated under the Societies Act of Alberta)

By DR. W. R. READ

For many years the citizens of the Drumheller area have been aware of the need for a suitable place to display the unique and unsurpassed fossil remains for which the area is famous. Despite the fact that dinosaur skeletons and other fossils, had been removed from the valley for over fifty years and were prominently displayed in museums at Calgary, Edmonton, Toronto, Ottawa and many centres in the United States and Great Britain, there had never been an organized effort to provide educational or tourist information at the source of these exhibits.

In the autumn of 1955 a small group of public minded citizens representing the Drumheller Business and Professional Women's League and the Drumheller and District Chamber of Commerce set up a small fossil display in the Club House at the Rotary Swimming Pool. The nucleus of this collection had been collected many years previously by the late C. A. F. Jungling. To this were added many fine specimens from local collectors and some items from the National Museum, Ottawa, and the Royal Ontario Museum, Toronto. Further displays were added in 1957, coincident with the opening of the Dinosaur Trail by the Drumheller Junior Chamber of Commerce. The interest in this small beginning was so great that in 1957 and 1958 over 10,000 visitors signed the guest book annually and in 1959 over 12,000. These visitors represent all areas of Alberta, including bus loads of school children, visitors from every Canadian province and American state and increasing numbers from overseas points. In September of 1959 a field party of 350 members of the Alberta Society of Petroleum Geologists visited the museum in a single afternoon. This overwhelming response has made it apparent that this area has an educational and a tourist appeal that cannot be denied.

By a fortunate coincidence the Canadian Museum Association held their National Convention in Calgary in 1957 and visited the Drumheller Museum and Badlands. The Drumheller Museum was stated to be the newest and smallest museum venture in Canada at that time. As the result of this association, Dr. Carl Guthe, an expert museologist inspected and reported on the Drumheller efforts. It became apparent that the modern museum is no longer a dusty place filled with disorganized materials, but a cultural and educational centre with a story to tell.

Realizing that the Drumheller Badlands has one of the most unique and interesting stories in the world to tell the Museum Society has set out to interpret the geological and prehistoric wonders of the area in the best possible way to the public. This has required two main avenues of attack.

1.—TECHNICAL AID—To date the Museum has received whole-hearted and invaluable technical support from:

1. Canadian Museums Association, of which this museum is a member.
2. Glenbow Foundation of Calgary.
3. National Museum of Canada, Ottawa.
4. Royal Ontario Museum, Toronto.
5. American Museum of Natural History, New York.

We are deeply appreciative of the interest these organizations have taken in our Museum and their efforts on our behalf. The National Museum at Ottawa is directing the preparation of a Duck-Billed Dinosaur skeleton excavated here many years ago. It measures 26 ft. long, 6 ft. wide and 11 ft. high and will be mounted in a swimming position, believed to be the position used by this great prehistoric lizard most of the time. This specimen will arrive about September, 1960, and will be an invaluable addition to our exhibits. 1960 is the year that A DINOSAUR IS COMING BACK TO DRUMHELLER!

This will also be the only exhibit of its type west of the Great Lakes and is usually found only in major museums.

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2.—BUILDING AND FINANCIAL CAMPAIGN — The facilities at the Swimming Pool building were soon found to be too overcrowded for adequate display purposes and unsuitable to cope with the increasing influx of visitors. A popular and instructive way to visit the area was soon found to be a visit to the Museum and then a tour of the Dinosaur Trail and other points of interest. In this way the visitor and local citizen alike, get a great deal more from their visit to Drumheller than previously. In addition the Museum has become a central and well used source of tourist information.

A Building committee worked for many months examining all available sites for possible enlargement of the Museum facilities. The final selection was a building measuring 45x60 ft., in new condition on 1st. St. East. This building was chosen after its approval by two museum experts and because of its reasonable price, availability and utility services, ease and access from No. 9 Highway, availability of ample parking and proximity to the business area. In 1959 a campaign for funds was launched netting close to \$10,000.000 and resulting in the purchase of this building. The City of Drumheller has been most generous in granting remission of taxes and water on this property and permission to use the adjacent parking area. The spring of 1960 will see the movement of the present collection to this building and the gradual transferral of it into modern, lighted displays which when completed will truly lift the veil of time and reveal the story of life dating back over untold millions of years.

The foregoing are the objectives of the Museum Society and when completed will provide a lasting and highly educational contribution to Drumheller, to Alberta and to all of Canada. Our goal is within sight but will require a further \$10,000.00 to be completed. The Citizens and Business enterprises of this area have been most generous in their contributions to the Building Fund. The Museum Society are deeply appreciative of their efforts. All donors receive receipts deductible from Income Tax. Anyone wishing to contribute to this fund may leave their donation at the Drumheller branches of the Canadian Bank of Commerce, the Bank of Montreal or the Treasury Branch, or mail them to: Mr. John C. Jensen, Box 320, Drumheller, Alta., or Dr. W. R. Read, Box 560, Drumheller, Alta.

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DRUMHELLER

THE DINOSAUR TRAIL

The Valley of the Red Deer River, in which Drumheller is situated, reveals some of the most remarkable scenery in Alberta. A visit to this "Graveyard of the Dinosaurs" provides a concrete link with the past. Here is history for the scholar, beauty for the artist, and satisfaction for the curious.

Over the years an official "Dinosaur Trail" has been developed for the convenience of visitors. The Trail was initiated in 1939 by the Drumheller Junior Chamber of Commerce on the occasion of a picnic to which the Calgary Jaycees had been invited. A specified route was desired for the guests, some of whom were expected late. Arrows pointed the way from Drumheller up Orkney Hill and down to Munson Ferry, also from Drumheller up Munson Hill to Munson Ferry. Shortly afterwards Lord Tweedsmuir, then Governor-General of Canada, visited the Dinosaur Valley to view one of the famous skeletons that had been partially unearthed.

The Dinosaur Trail was not completely marked until 1953, at which time the No. 9 Highway, previously rough and dusty, provided a modern, all-weather access route to the Valley. The Trail then became a focal point about which the tourist could concentrate his activities; further improvements were subsequently made—including a Snack Bar and Rest-Room facilities near the site of the "Little Church."

At present the Dinosaur Trail forms a thirty-mile loop through the scenic Badlands. Beginning one quarter mile north of the new bridge across the Red Deer River, the Trail runs west for five miles to the World's Largest Little Church, north for five miles, then west to the Munson Ferry, with a three-mile detour to the Horsethief's Canyon Viewpoint, in the West Drumheller Oil Field. From Munson Ferry a two-mile dirt road leads up the Valley to the Dinosaur Bone area. The return route from Munson Ferry leads south out of the valley for a mile, then down the Orkney Hill and back to Drumheller on the south side of the river.

Both local and Provincial Government authorities have shown substantial interest in the development of the Dinosaur Trail as a first-class tourist attraction. Under construction at the present time is a new road running west up the valley from the Largest Little Church, project to be completed to Munson Ferry, and then to Morrin Bridge. Moreover, recent plans of the Drumheller Senior Chamber of Commerce call for the erection of a dinosaur replica at the western approach to the Drumheller Bidge.

The Jungling collection, which provided the foundation for the Drumheller Museum, was purchased in 1942 from the Jungling Estate by the Drumheller Jaycees, for the sum of \$300.00. This was probably the best collection of Dinosaur bones ever made in the area. The Jaycees kept the fossils in the local bungalow schools for years until they were turned over to the Museum Society and restored.

(Continued on Following Page)

Tourists and Visitors

We wish to add our welcome to you when you visit Drumheller to tour our famous Badlands and District, as well as visiting the Drumheller Museum.

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Various residents of the valley have made extensive collections of fossil remains found along the Dinosaur Trail. Many of these have been preserved in the local museum. Most easily located by the casual but observant visitor are petrified wood, petrified tropical fruits, cones, crystallized shells, and the juniper wood that can be fashioned into beautiful figurines.

The whole area is in a setting that can best be described as awesome, from the strangely-eroded hills—a photographer's paradise with their changing colors—to the wind-washed Hoodoos, sitting like giant mushrooms beside the highway eight miles east of Drumheller on the way to East Coulee.

Travellers have a wonderful experience when they visit this unique Valley of the Dinosaurs, and traverse the Dinosaur Trail. Anyone contemplating a trip to Drumheller should be prepared to enjoy the fascination of the Dinosaur Trail as the highlight of the excursion.

PIONEER FOSSIL HUNTER

Mr. W. R. Fulton's interest in the Badlands was aroused shortly after his arrival in 1910. With the removal of the first dinosaur in 1912 by Mr. C. M. Sternberg, of Ottawa, a personal friend, his enthusiasm was greatly increased. Mr. Fulton became an ardent fossil hunter and spent much time in the valley and gave special attention to the ravines.

His wanderings were usually well rewarded as he accumulated one of the most outstanding and fascinating collection of dinosaur bones, petrified wood, shells and many relics of the past, which are on display in two basement rooms in the Fulton home. An added attraction is a lighted display case, when illuminated it brings out the dazzling colors of the many specimens it contains. This display has been viewed by scientists, geologists, professors and tourists in many walks of life and has done much to promote interest in the Badlands.

Due to health and age, Mr. Fulton has been forced to close his display to the public. It is with real regret as he still maintains a great interest in his hobby of the past.

APPRECIATION

From registrations at the Drumheller and District Museum and the Biggest Little Church on the Dinosaur Trail, tourism in the valley has shown a wonderful increase. After checking the addresses of the signors, the Badlands can be acclaimed a world-wide attraction.

This is the Fourth Annual of the Badlands of the Red Deer River and I wish to thank the advertisers for their continued support in making it a huge success. In 1957 three thousand copies were printed, but for 1960 eight thousand copies will be distributed.

I also wish to thank the Alberta Travel Bureau and the City of Drumheller for their cooperation that made the increased circulation possible.

To those who spent much time and study in preparing the reading material, I wish to extend my appreciation.

The distribution will be through the advertisers, the Drumheller and District Museum, the Alberta Travel Bureau, the Tourist and Information Bureau, Calgary, and other Tourist Bureaus, including Medicine Hat, Fort Macleod, Lethbridge, Edmonton and Saskatoon, Sask. Many write for copies and the mailing list is increasing rapidly.

Thanks again.

—T. B. McFARLANE

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Mr. Pluto is a real booster of the Badlands and has on display a wonderful personal collection.

DRUMHELLER: PAST AND PRESENT

By MARION SMITH

When Alberta became a Province in 1905 the Red Deer river valley was still a part of the old west—open range where cowboys rode its deep canyons in search of their herds and prairie wool waved along the flats beside the river. Although a few ranchers had built homes here, no plow had as yet touched the virgin soil.

In less than ten years time the valley was dotted with homesteaders cabins; a mine was shipping out two carloads of coal a day on the newly constructed C.N. railroad and the pioneer settlement beside the fording place on the river had grown sufficiently to be incorporated officially as the Village of Drumheller in the year 1913.

It has been said that Drumheller owes its origin to mules, miners and model T's because all three could be depended upon when the going was tough. The six-mule teams hauled the first freight, lumber and supply wagons through the valley, down steep narrow trails with only a few feet to spare between cliff and chasm. Later the old faithful Model T's bounced and backfired over trails only slightly better. Take a look at the old road leading up the cliff of the village of Wayne and you will wonder how they ever made it up that hill. The industry of the miners put Drumheller on the map as a coal town.

And so it was that the town grew, helter-skelter; hand over fist as though to make up for lost time. Farmers prospered and more mines opened. After World War I immigrants came in to work in the mines, a strong stocky breed of men who could work prone or bent double for long hours. They faced danger every day yet were glad of a chance to work and become citizens of a new land. In later years, with modern equipment, some twenty mines operated simultaneously producing a million tons of coal annually.

The Badlands of the Valley being a natural setting in themselves, Drumheller, in its early years had all the elements of a Western movie. Only there was a "law agin carrying' guns, pardner", and the mines were not producing gold or silver to be hi-jacked by the "Bad Guys". Still, we had the characters; a colorful mixture of pioneer folk, the steady church-going townfolk contrasting the hell-for-leather cowboys who would ride down to Drumheller for a spree. Add to this the growing force of miners with big payrolls to spend, inevitably followed by those unscrupulous types of girls and gamblers who influenced that spending. Then indeed! The policemen's lot was not a happy one!

Hamlets or mine camps had grown up around each mine, being no part of the city proper, at intervals covering a distance of twenty miles up and down river from Drumheller. Here assaults and robberies were not uncommon and a stranger entered at his own risk. In troubled times no man answered his door at night without a shotgun handy. When Prohibition clamped the lid on this melting pot, who can say that it did not boil over in certain, secret places?

But all this was some forty years ago. The old mines with such catchy names as the Moonlight, the Western Gem, the North American and the Sunshine and many others, are long since gone. The only reminders of them are in the tales the old-timers tell and the black slag heaps scarring the hill-sides and a few cement pillars half hidden by tall weeds.

Paved highways replace the pioneer trails; modern service stations replace the livery stable. Just as today's citizen will tell you Drumheller Valley is a fine place to live and bring up a family.

Today's Drumheller is a growing modern city, trading centre of a prosperous farming country whose World Wheat Kings and Championship livestock are nationally famous. Oil and gas wells have added to the economy,

(Continued on Following Page)

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the latter supplying cheap domestic fuel for the many homes and business establishments.

A new four-lane concrete bridge replaces an older steel structure, close by the old fording place across the Red Deer.

Drumheller's tourist traffic is increasing each year as thousands of visitors come to see the pre-historic museum and tour the Dinosaur Trail. A new motel has been opened on Riverside Drive for the convenience of these welcome guests. Tourist cabins and a Government Campsite are located in North Drumheller. There are also several hotels throughout the valley eager to be of service to the tourist.

Many fine new buildings have added distinction to the city in the last few years. These include a new Court House; R.C.M.P. Barracks; Provincial Building; Old Folks Home; a Catholic Separate School and Riverview Park sub-division with many fine new homes.

Building permits issued in 1959 amounted to \$969,455.00. Building prospects for 1960 look even brighter. A new school gymnasium and a chronic hospital are to be built and possibly a new addition to the Municipal Hospital.

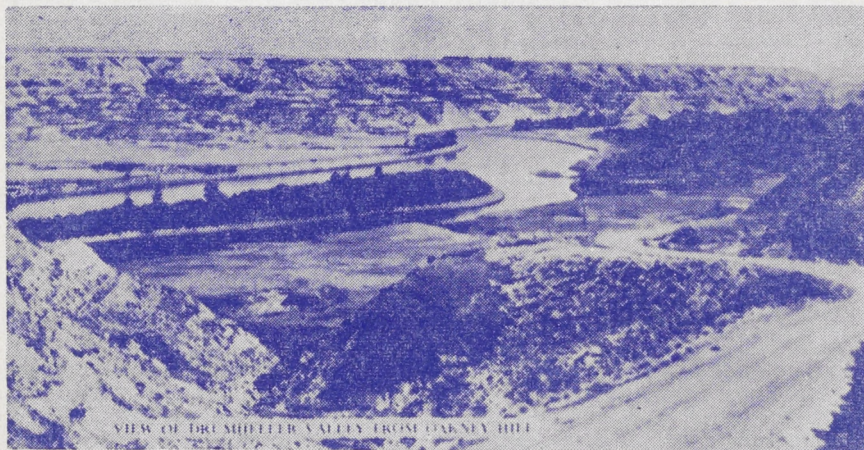
New businesses include Radio Station CJDV, the Voice of the Big Country; the Alberta Gas Trunk Lines Company erected its headquarters here and built twenty new homes for its employees.

The Canadian Utilities Plant has long been one of Drumheller's major industries, generating electricity from slack coal to supply a large radius of the surrounding country.

Sport has been well organized with Pee-Wee, Junior and Senior baseball, football and hockey clubs. The Museum, swimming pool, tennis court, picnic grounds, Memorial arena, curling rink and baseball park are all centralized in one area along Riverside Drive between First Street West and Second Street East.

Fishing is good in May and June with goldeye, pickerel and perch in the river and rainbow trout to be had in a dam near town. A fine golf course is situated off No. 9 Highway atop the Twin Hills. From here one has a wonderful view of the fine little city nestled in the heart of the Badlands.

Though generations of men may come and go, this wonderful Grand Canyon of the Canadian Plains changes not. Though from the first Crees who scouted these hills and set up their tepees by the river right up to the modern paleontologists probing its prehistoric secrets, each has left his mark on its history.



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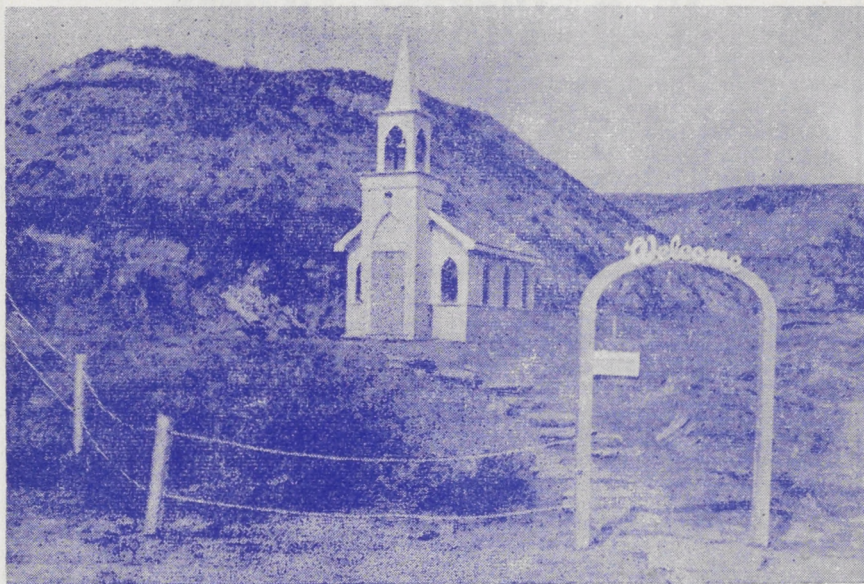
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In response to hundreds of requests to tell the background and origin of the Little Church, Reverend Edgar Charles O'Brien, the man with whom the idea originated, has written the following article.

"It was July, 1957, when I first toured the famous Dinosaur Trail. The Drumheller Pentecostal Church had called me to be their minister and, anxious to become acquainted with my new surroundings I was investigating the local tourist attractions. The Trail, I was told, was one of the primary attractions and had drawn upwards of 5,000 persons to view its rugged badlands surrounding the previous year.

As a Minister of the Gospel, the figure 5,000 tourists immediately presented a challenge—how could I, just one man, do something to direct such a tide of humanity toward God. If only somehow I could start them thinking about the Creator of Heaven and Earth whose existence predated even the 90 million-year-old fossils that dotted the landscape.

I take no credit for thinking up the idea of a Little Church but rather feel that it was an inspiration from Him whose throne is in Heaven and whom all men ought to worship. Though all do not worship in like manner, yet all would have equal privilege to use the chapel to meditate as they choose.

The ready response from all who heard of the idea proved only its Divine origin. A local builder, Tygve Seland, constructed the church without cost, donating such material as well as labour. A Drumheller businessman-artist Robert Gibson designed and painted the windows and donated them. Many businesses contributed fixtures and material until it stood complete.

The Canadian Utilities Limited sent a crew of workmen to the site chosen for the location and had a special underground line laid to supply power for lights and recorder. A building-mover, Art Parge volunteered men and equipment to move the tiny 7 by 11 foot chapel from its place of construction in the lumber yard to the low hill upon which it now stands on the farm of the F. C. Smiths, four miles west of the city on the Dinosaur Trail.

(Continued on Following Page)

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A local amusement company loaned record-playing equipment and members of the Drumheller Ministerial prepared special 3-minute meditations for playing thereon.

On July 9th, 1958, just a year after my arrival in Alberta, the Little Church was officially opened to the public. Honourable Gordon E. Taylor officiated at the ribbon cutting ceremony; His Worship Mayor E. A. Toshach represented the city; I read scriptures and offered the dedicatory prayer; a great crowd of people who attended, later filed through to sign the guest book and register their name on opening day.

A distinct honour was paid the Little Church later that fall when Alberta's late Lieutenant-Governor the Right Honourable J. J. Bowlen officiated at the bell-hanging ceremony as the Canadian Pacific Railway Company donated a locomotive bell to be hung in the miniature steeple. General Superintendent for the Alberta district, Mr. D. M. Dunlop, represented the company and spoke of the changes brought our nation as diesels replace the steam engine, thus making the signal of the bell unnecessary for rail traffic but still desirable for calling worshipers to the place of prayer.

When the flow of visitors did not let up at the end of the customary tourist season, it was decided to keep the church open throughout the winter and according to the guest book, each week throughout the year saw new names added therein. More than 50,000 visitors had registered within the first 12 months, and many more had failed to register.

Many people from far away places have written enquiring about the chapel, some have sent me newspaper clippings from various places across the nation and around the world telling of the church. Some newspaper stories have dubbed it the "Pushbutton Church" since the worshiper need only push a button to select the sermon by the faith of his choice.

Among the letters received are many telling how encouraged and refreshed in spirit the visitor felt after pausing to worship for a few minutes in the Little Church. One such letter tells how the visitor had premeditated suicide but had his mind changed after finding spiritual strength as he sat alone one night in the church on the Dinosaur Trail.

Weddings too have been solemnized at the miniature altar in this church. The first one received widespread publicity and was even televised for release on a national newscast.

Although the primary purpose for the erection of the unique church was to call the attention of those who passed along the Trail to the Creator who had watched the formation of the Badlands through the millions of years required, yet the steeple has done more than point men to God. It has also drawn scores of tourists to Drumheller and assisted in a growing industry commonly known as "Tourism." This has been greatly appreciated by many as a side effect, but as you visit the "World's Largest Little Church" may your moments here bear the main effect, namely let your mind be directed to God as you pause in worship.

—Rev. E. C. O'Brien.

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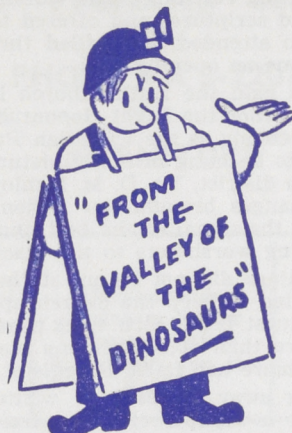
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DRUMHELLER COAL

By S. G. McMULLEN

Tourists in the Drumheller area naturally become interested in Coal and frequently desire to know more about it. In order to assist them in their desire for knowledge the following data have been compiled from questions most frequently asked. This is in the form of Questions (Q) and Answers (A).

Q.—How many seams of coal are there in the Drumheller Area?

A.—Ten recognized seams, numbered from 1-10 in order upwards from the bottom seam.

Q.—Are all these seams workable?

A.—Seams 1, 2, 5 and 7 are the seams that are and have been mainly worked commercially.

Q.—Can all these seams be seen in the Valley?

A.—Yes. Since the strata of the Valley dips approximately 20 feet to the mile going westward, all these seams can be seen on the valley walls but not all at the same place. For example the number 1 seam is approximately 150 feet below the floor of the Valley west of Drumheller and outcrops at the base of the Valley at Aerial, east of Rosedale.

Q.—When did they start to mine coal commercially in the Valley?

A.—1911, at the Newcastle mine just west of Drumheller.

Q.—How much coal has been mined in the Valley since that time?

A.—Approximately 60,000,000 tons.

Q.—What kind of coal is mined in the Valley?

A.—The coal is classified as Sub-Bituminous B.

Q.—What are the uses for this type of coal?

A.—Domestic and industrial heating and the generation of electricity.

Q.—What are the characteristics of this type of coal?

A.—It is a bright and shiny black, hard and blocky, very clean to handle, low in ash, free burning and produces practically no soot. These characteristics make it the ideal coal for domestic use, with the result that the larger sizes are mainly used for this purpose and the smaller sizes for industrial purposes.

Q.—Where is Drumheller Coal sold and used?

A.—From the U.S.A./Canada border in the south to Churchill, Manitoba in the north, and Quebec in the east to Vancouver Island in the west.

Q.—What is it like in a coal mine?

A.—Dark, but pleasant. The temperature averages about 60 degrees all year round. Since the coal seams can be considered as horizontal, there is coal on all sides when following the seam, and in most of the mining practices here some coal is left on the roof and floor, so that one is entirely surrounded by coal.

Q.—How do the men see to work?

A.—Each man carries his own electric lamp with a battery that is good for about nine hours. The lamp is put on the man's cap, and the battery hangs from his belt. After the shift is over the lamp is recharged. Some sections of the mines are also illuminated with electricity.

Q.—Are horses still used in coal mining?

A.—Very few horses are used in coal mines today. Electric trolley and battery locomotives, hoists, shuttle cars and belts have replaced them.

Q.—When they were used were they all blind?

A.—No, definitely not. The horses were well looked after in good stables, lived in an even temperature and had the best of food and care.

Q.—Are the mines mechanized?

A.—The mines in the Valley are all mechanized and modern as far as condi-

(Continued on Following Page)

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tions allow. Some machines that are used in the U.S.A. cannot be used here due to the underground and/or marketing situation.

Q.—What kind of equipment is used underground in the mines?

A.—LOADING MACHINES, Red Bird and Joy mobile loaders and Goodman Duckbills. CUTTING MACHINES, Shortwall and arc wall for under-cutting, topcutting, shearing, etc., with electric trolley locomotives, battery locomotives, rope haulages, conveyor belts and shakers, drop bottom mine cars, etc., and various types of fans, drills, car pullers, etc. All the above electrical equipment is explosion-proof and permissible.

Q.—Are explosives still used to knock down the coal and break it?

A.—In most mines here compressed air has replaced explosives. Compressors putting out air at up to 10,000 pounds per square inch pressure, are used in lieu of explosives. This eliminates smoke and fumes and gives a much better product.

Q.—What are the large surface plants at the mine called and what are they used for?

A.—The plants are called preparation plants or tipples. In these buildings are the screening plants and picking tables where the coal is separated into various sizes, impurities are removed, and any pieces of iron and steel removed by magnets; the coal is oiled to eliminate dust, and is placed into bins or chutes ready to load into railway cars or trucks. Other buildings around a mine are offices, machine shops, warehouses, wash houses for the crew, garages, loader houses, etc.

Q.—What are the piles of red coloured "stuff" around the mines?

A.—These are dumps of shale piles, and consist of the impurities that are removed from the coal at the mines. The piles catch fire and the coal in them burns leaving the shale as a residue. This shale is used for drive-ways, tennis courts, fill and railway track ballast. In various places in the Valley red shale can be seen on and in the hills. This is the ash left when a coal seam burns.

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- Q.—Do they find anything besides coal down the mines?
- A.—There are sometimes thin seams of bentonite, but no minerals like gold, silver, iron ore, etc. Some fossils, i.e., petrified wood, leaf impressions, and amber, etc., are found.
- Q.—When the coal is taken out what happens to the space where it used to be?
- A.—During mining timber is used to prevent roof falls and control caving. After all the coal in any given area is extracted the place is allowed to cave by itself, in some instances caving has to be induced. Unless the coal seam is very close to the surface this caving does not reach up to the surface.
- Q.—How do the men get air underground?
- A.—Each mine has at least two openings to the outside, and by using large fans air is forced into one opening, then through all the workings inside the mine and finally out the other opening, thereby giving a complete circulation of air throughout the whole mine at all times.
- Q.—Is it dangerous to work in a mine?
- A.—Today, mining is subject to strict rules and regulations by the Government of Alberta and danger is reduced to a bare minimum. Most accidents in the mines are caused by carelessness on the part of individual workmen.
- Q.—Since about 60,000,000 tons of coal have already been removed from the Valley is there much left?
- A.—Government figures show that this amount is a mere fraction of the coal available in the area.
- Q.—Is it possible to visit the mines in the valley, on top or below ground?
- A.—Each mine has its own rules in this regard and the question cannot be answered generally. The Mining Companies and the people employed by them are all very interested in the industry and can answer any other questions that might have been overlooked here.

THIS IS THE BIG COUNTRY

The Big Country is the Canadian West; it's a country of swishing grain fields; miles and miles of rolling cattle country; a country of oil wells, and some of the most amazing sights man has ever seen. The Big Country is a red and gold sunrise in the East, and it's a purple and silver sunset in the West. It is a clean south wind, and a pale blue sky. It's a flower on a cactus, or a dust cloud raised by a herd of cattle. It is the tippie leaning into the hillside waiting for another load of coal, and too, it's the man standing bareheaded in the field, letting the good grain trickle through his fingers.

The Big Country is all of this and more. It is the roar of diesel engines driving a bit into the earth. It is the glint on a silver oil field battery tank, and it is the whistling rumble of a locomotive thundering through the dark prairie night. The Big Country is many things to its many people; a child running for a yellow school bus, a four-man orchestra playing to a smiling laughing crowd in a community hall in a small prairie town, or the crack of a .22 rifle as the apprentice deer slayer practices on a bobbing rabbit. It is a country that has lived a full life of adventure, a colorful life . . . it has been shrouded in gunsmoke in its day, and drifted over with earth in the summers of the dusty days gone by. It has been mantled with crisp clean snow in winters, and crocuses in the spring of every year since time began. The Big Country as everything a man could ever want . . . not sky scrapers or mile upon mile of cluttered concrete sidewalk or hard-top road. The Big Country has a softness, an openness; a cleanness that you can find nowhere else in the world.

For in the beginning the Lord made Heaven and Earth, and He took a bit of each and set them down on this part of Alberta; now known far and wide as The Big Country.

—T. W. DOWSON,
Production Manager, CJDV.

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The following has been kindly submitted by Ernie Saran

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Calgary is the financial centre of the Canadian Oil Industry and more than 400 Canadian, United States and British oil companies have their Canadian head office here.

In Calgary you have the centre of a vacationland that has everything to hold the interest of the visitor. Within a two-hour drive from the city there is Banff, the Beautiful and the Majesty of Canadian Rockies; the Foothills Ranching Country in a setting of unspoiled bushland; the Red Deer Valley and the Dinosaur Valley in the Drumheller Badlands; oil and gas wells, hunting and fishing, mountains and prairie, lakes, rivers and streams. We have a wonderful and invigorating climate which produces an abundant array of beautiful flowers in the parks and gardens of Calgary.

In East Calgary, on an island in the Bow River, is a beautiful park and playground with picnic facilities. Here you will find Canada's most complete zoo with over 900 specimens of over 300 varieties of animals and birds. This park is open all year from 8 a.m. until dusk. But the most remarkable part of this park is the unique exhibition of prehistoric animals. The originator of the Calgary Zoo, Dr. O. H. Patrick, had business interests in Drumheller and while there he became interested in the remains of prehistoric life found so abundantly in the Drumheller Badlands. So the Calgary exhibit on St. George's Island started and grew and is still growing. John Kanerva, a sculptor, is working and creating day by day the accurate and life-like replicas of prehistoric animals which take you back to another period of time as they peer at you from the trees and bushes on the island. Today there are 45 of these models, the largest of which "Calgary's Dippy" stands over 30 feet tall.

It's been nice taking you to a few of the attractions in and around Calgary. Hope we will see you soon in person, a real friendly western welcome awaits you in Calgary.



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THE HOODOOS

The rock terraces of the valley walls are stratified horizontally. This type of sedimentary formation commonly provides alterations between layers that are distinctly resistant to weathering and erosion and those that yield rather readily. There is commonly a far greater thickness of weak beds. Various stages of this process may be seen where the strong beds are gradually undermined and exposed as shelves. The process of differential weathering is continually going on, and the appearance of the badlands changes slowly but perceptibly from year to year.

Detached pillars representing an earlier position of the sedimentary beds are often isolated and capped or protected by a portion of the strong beds. These are the pedestal rocks found in various parts of the valley and popularly called "Hoodoos." The group at Willow Creek are the most easily accessible.



No sculptor's chisel has bitten into this sandstone to inscribe the Epitaph of the Dinosaurs, but here they stand, tall columnar tombstones guarding the resting place of the giants. No living thing was left to tell of the greatness of the Badlands, so nature fashioned these memorials with wind and rain.

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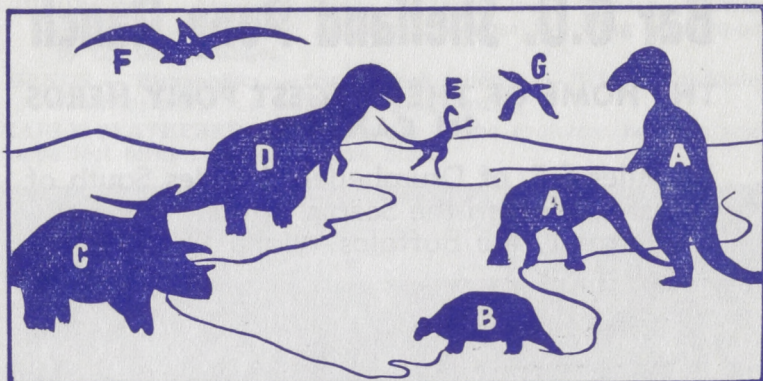
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THE ART CLUB MURAL

By DR. W. R. READ



The ART CLUB MURAL was painted and presented to the Museum by the Drumheller Art Club in 1957. The mural accurately depicts the Dinosaurs of the Cretaceous period found in the Badlands of the Red Deer River.

The late Cretaceous period had a warm, equable, semi-tropical climate, with palms and ferns along the rivers, inland seas and lakes. There were also upland regions of some height forested with such familiar trees as oaks, willows, sassafras and hickory.

The forms of animal life depicted are classified as follows:

HERBIVOROUS (PLANT-EATING) DINOSAURS

ORDER — Ornithischia from Greek "ornithos—'Bird'+ischion—'Hip'; so named because the hip or pelvis is smaller to that in birds.

A—DUCK-BILLED DINOSAURS

SUBORDER — Ornithopoda — from Greek "ornthos — 'Bird'+podos 'foot'"; hence with birdlike feet.

GENUS — Hadrosaurus — from Greek "hladros — 'Bulky'+sauros — 'Lizard'".

- or -

Trachodon—from Greek "trachys—'rough'+odon—'tooth'"; so named because the teeth form a rough sort of pavement.

B—ARMOURED DINOSAUR

SUBORDER — Ankylosauria — from Greek "ankylus — 'curved'+sauros 'lizard'"; because of strongly curved ribs.

GENUS — Palaeoscinus — from Greek "palaios — 'Ancient'+skinkos 'Lizard'"; in reference to tooth structure resembling a modern sand lizard, the skink.

C—HORNED DINOSAUR

SUBORDER — Ceratopsia — from Greek "keratos — 'Horn' + ops — 'Face'".

GENUS — Various depending on the shape of the frilled collar and type of horns; e.g. "Monoclonius"—Single horn; "Triceratops"—Three horns; "Chasmosaurus"—Openings in the frill or collar, etc.

CARNIVOROUS (FLESH-EATING) DINOSAURS

ORDER — Saurischia—from Greek "sauros 'Lizard'+ischion 'Hip'; the Dinosaurs having a pelvis or reptilian form.

D—SUBORDER — Theropoda — from Greek "ther 'beast' (or mammal)+Podos 'Foot'".

GENUS — GORGOSAURUS — from Greek "gorgos — 'Terrible' +sauros 'Lizard'".

E—GENUS — Struthiomimus—from Greek "stroothion 'strich'+mimos—'an imitator'".

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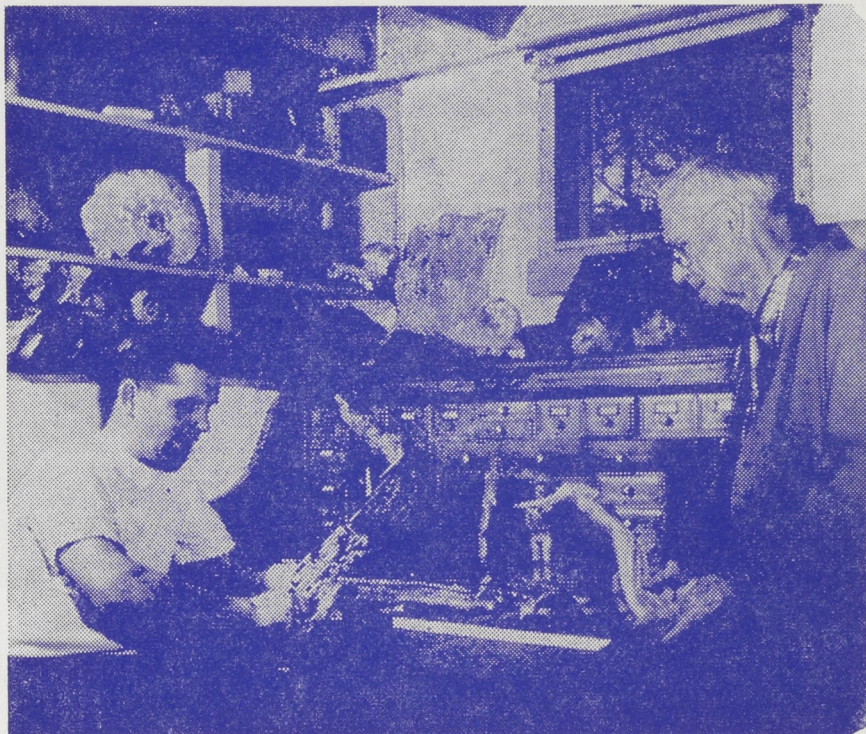
F—FLYING REPTILE

ORDER — Pterosauria — from Greek “pteron ‘Wing’+sauros — ‘Lizard’”.

SUBORDER — Pterodactyloidea — from Greek “pteron — ‘Wing’+daktylos — ‘Finger’”; so named because the wing was supported by the fourth finger.

GENUS — Pteranodon — from Greek “pteron — ‘Wing’+anodontos — ‘Without teeth’”; a toothless flying reptile.

G—EARLY FEATHERED BIRD—A stage in the evolution between ancient, imperfect birds and the modern bird.



A shovel is a time machine in the Badlands, and each time it turns over a blade of dirt we are able to see into the past. These fascinating samples are contained in the collection of Mr. W. Fulton (left) who has spent many years unearthing the secrets which have been buried in the valley of the Dinosaurs for so many millions of years.

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THE FISH HATCHERY AND CALGARY BREWERY GARDENS



A capsule view of several of Alberta's natural attractions for the tourist can be seen in a visit of a few hours or so to the Calgary Brewing and Malting Co. Ltd. plant and gardens in Calgary.

Located in East Calgary near the confluence of the Bow and Elbow rivers—the historic site on which a mounted police contingent landed in 1875 to establish Fort Calgary—the Calgary Brewery grounds cover 10 acres. The area is only a few blocks away from another tourist attraction, St. George's Island park where replicas of giant reptiles whose remains have been found in the Dinosaur Valley near Drumheller are displayed.

The beautiful gardens of the Calgary Brewery are a miniature of Alberta's natural beauty. Here tiny waterfalls imitate the rushing streams and rivers of the eastern Rocky Mountain watershed; quiet pools simulate the province's vast fresh water lake areas, and wild and cultivated flowers, shrubs and trees reflect Albertans interest in the Agricultural and horticultural industries of the province.

The little streams and pools of the gardens are stocked with a variety of fish, types of which abound in Alberta lakes, rivers and potholes. The fish in the outdoor pools are for display only, but within the brewery premises the Alberta government department of fish and wildlife operates one of the largest fish hatcheries on the continent. The fish hatchery operation was instigated by the Brewery in 1938 and very soon gained the co-operation of the provincial government. A working agreement now provides that the

(Continued on Following Page)

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Brewery supplies the premises and equipment while the government staffs and operates the hatchery. Since the project originated, the hatchery has produced about 90 million fish yearlings, fingerlings and eyed eggs for planting in the provincial streams, rivers and potholes. Varieties include rainbow, cutthroat and Dolly Varden trout, eastern brook trout and loch leven or brown trout.

The gardens are open to the public and can be visited and enjoyed any time during daylight hours. After dark is the best time to see the garden's special December attraction when the grounds are beautifully illuminated and peopled with enchanting figures from children's fiction.

The fish hatchery is open to the public daily from 8:30 to 4:00 p.m.—11 a.m. to 8:30 Sundays.

Guided tours through the Brewery plant are conducted daily at 10 and 11 a.m., 1:30, 2:30 and 3:30 p.m. The visitor who joins one of these tours will be impressed by the fact that three of Alberta's major industries—petroleum, grain growing and cattle raising—play a vital part in the brewing operation. Natural gas is the fuel source being used to heat the automatic low pressure boilers, the grain driers and the tremendous copper brew kettles. Barley used in the beer-making process is the high grade malting barley produced exclusively in Western Canada, and the dried grains discarded from the manufacturing process are converted to a high-protein cattle feed and sold to Alberta's farmers and cattlemen who raise the top grade beef for which the province is also famous.

The complete tour of the brewery plant, including commentary by official guides, requires about 45 minutes.

Another highlight of the brewery tour is viewing the 90-foot water well, excavated in 1892 when the brewery was founded, and still in constant daily operation. Four other wells like this original one tap an underground river to supply the brewery for all water used in the manufacturing process. Surplus water from the refrigeration plant is used to supply the troughs and rearing ponds in the hatchery and is piped to the pools and streams of the garden.

Soon another Western feature will be added to the Calgary Brewing and Malting Co. Ltd. attractions for the visitor. Presently under construction is a \$430,000 aquarium and museum building. First floor of the building, located at the west end of the Calgary Brewery grounds, will accommodate 40 small tanks of tropical fish, 24 tanks of larger species of fresh and salt water fish, and a pit for alligators and other reptile exhibits. It will open to the public later this summer.

Another ambitious project, a Western theme museum will occupy the second floor of the building. Here exhibits will trace the history of the Western horseman from the days of Cortez to the present, and will dramatically depict many of the developments in Alberta's history. Some exhibits suitable for the museum have already been collected by officials of the Calgary Brewing and Malting Company Limited, and more are being sought.

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cinal absorbent dressings, for molds and cores in foundries, in refining petroleum and in oil well drilling mud.

The oldest formation easily identifiable in this area is the Bearpaw. It underlies the Edmonton and is clearly seen as the layers of dark brown shales, beneath the "hoodoo forms" at Willow Creek. It was so named because of similar beds exposed in the Bearpaw Mountains in Northern Montana. It is of marine origin, and the deposits were laid in a shallow sea which came in from the south-east. The shales vary in colour from drab grey to chocolate brown. A peculiarity of the sedimentation is the apparent isolating of marine fossils in the iron and calcareous nodules. Except in the nodules, fossils are rarely found. The Bearpaw formation contains no Dinosaur remains. It extends along the Red Deer river from Willow Creek to the vicinity of Berry Creek.

Found only well down river from Drumheller is the Belly River formation. It underlies the Bearpaw and yields abundant Dinosaur remains from Berry Creek to Steveston of 15-25 miles. Many Dinosaur specimens have been excavated at Steveston. This formation also contains coal.

THE ICE AGE

It should be pointed out that the Red Deer River valley at Drumheller is pre-glacial in origin. The final and present scene was in a large part sculptured by the ice ages. These were found in number, the most recent being 25,000 years ago and the most distant in the neighborhood of one million years ago. The area was covered by ice to an elevation of approximately 4000 feet. The sheet of ice which covered the area was the Laurentide ice sheet which centred on Hudson's Bay. It covered all of Canada and part of the U.S.A. to an area greater than the present ice cap of the Antarctic continent. The glaciers left behind boulders, gravels and moraine-like ridges composed of rocks transported from areas far to the north-east. Thus in the valley these rocks, which are not of Cretaceous origin are often mixed with those of the Tertiary period. This condition occurs chiefly in the valley floor, the horizontal portions of the terraced walls and in coulee bottoms.

EARLY DINOSAUR DISCOVERIES

The most famous petrified remains found in the Drumheller Badlands are the Dinosaur bones. While one may find abundant petrified wood, and fossil shells, berries and cones, and even whole beds of oysters, it is the Dinosaur remains that have made the area famous among paleontologists the world over.

In the summer of 1884, Dr. J. B. Tyrell was dispatched by the Dominion Geological Survey to investigate reported exposures of coal in the Red Deer River Valley. While thus engaged he discovered the bones of a petrified monster exposed on a hillside near Knee Hill Creek. This was the first Dinosaur discovery in Alberta. Dr. Tyrell packed and sent specimens to Ottawa and Philadelphia for examination. He did not report his find in the scientific journals until 1887. Ten years later the Red Deer Valley was visited by Dr. Barnum Brown, who devoted his life to the study of Dinosaurs. Dr. Brown was working for the National Museum of Natural History at New York. He took specimens back to New York and the Museum of Natural History has sponsored many expeditions to the area and now has the largest collection of Dinosaurs in the world. Dr. Charles H. Sternberg Sr., explored the river by floating down the river on a raft from Red Deer in 1912. On August 12th of that year he discovered the first complete Dinosaur skeleton to be unearthed in Canada. He made many further trips to the area accompanied by his sons, who continued to work in this area until quite recently. Many of the Sternberg specimens are on display in the National Museum at Ottawa and at the Royal Ontario Museum at Toronto. The latter institution has a range of Dinosaur specimens from this area second only to that of New

(Continued on Following Page)

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York. Almost every year further scientific expeditions carry out explorations and excavations here, the most recent being headed by Dr. Wann Langston Jr., of the National Museum, Ottawa, which excavated and collected a fine specimen of *Edmontosaurus* (Duck Bill) in the Munson Ferry area in 1955-56.

Since 1912 more than 30 Dinosaur skeletons have been excavated in the Drumheller area, and over 45 species have been identified. Dinosaur remains have been found as far east as Manitoba. To the south many specimens have been collected in Montana, South Dakota, Wyoming, Colorado, Utah and New Mexico. They also occur in Europe, Asia, Africa and South America. The discoveries which have been made in the Drumheller area however, have been ranked by leading authorities as second to none.

THE AGE OF REPTILES

The Age of Reptiles began in the early Cretaceous period or about 200,000,000 years ago. Reptiles are cold-blooded, scale-covered, air-breathing vertebrates that deposit eggs from which the young are hatched.

Reptiles developed from Amphibians and, therefore, appeared much later in the earth's history. They were the first great animal group adapted for living on land throughout their life. Many types evolved and spread over the earth. The time of their greatest development was between 130 and 60 million years ago. Because of the great size and strength of some form and their predominance over all living creatures at the time, this period is known as "The Age of Reptiles." Most of the forms living then are now extinct, but there are some survivors (Turtles, Snakes and Crocodiles), although they are no longer the dominant group of animals. The fossil evidence indicates that alligators, for example, once were common residents over much of North America and Eurasia. Now they are only found in tropical areas, which resemble closely their habitat of millions of years ago.

There are five great divisions of Reptiles:

DINOSAURS—land and swamp forms.

MARINE REPTILES—those that returned to the sea.

TURTLES, CROCODILES—both adapted for land, but spending much of their lives in water.

FLYING REPTILES.

DINOSAURS

Cold stone fossils, truly a calendar of life, give us a great insight into the lives and forms of this extinct, but once dominant group of reptiles. At first they were small and slender, not the terrible beasts they were to become. The early forms ran two-legged across the monotonous highlands of the west in the inland Sea. These were the Upland Types. Few of their bones and skeletons have been found because their higher and drier habitat did not lend itself to the preservation of their remains.

The Dinosaur remains found in the Drumheller area are all from the
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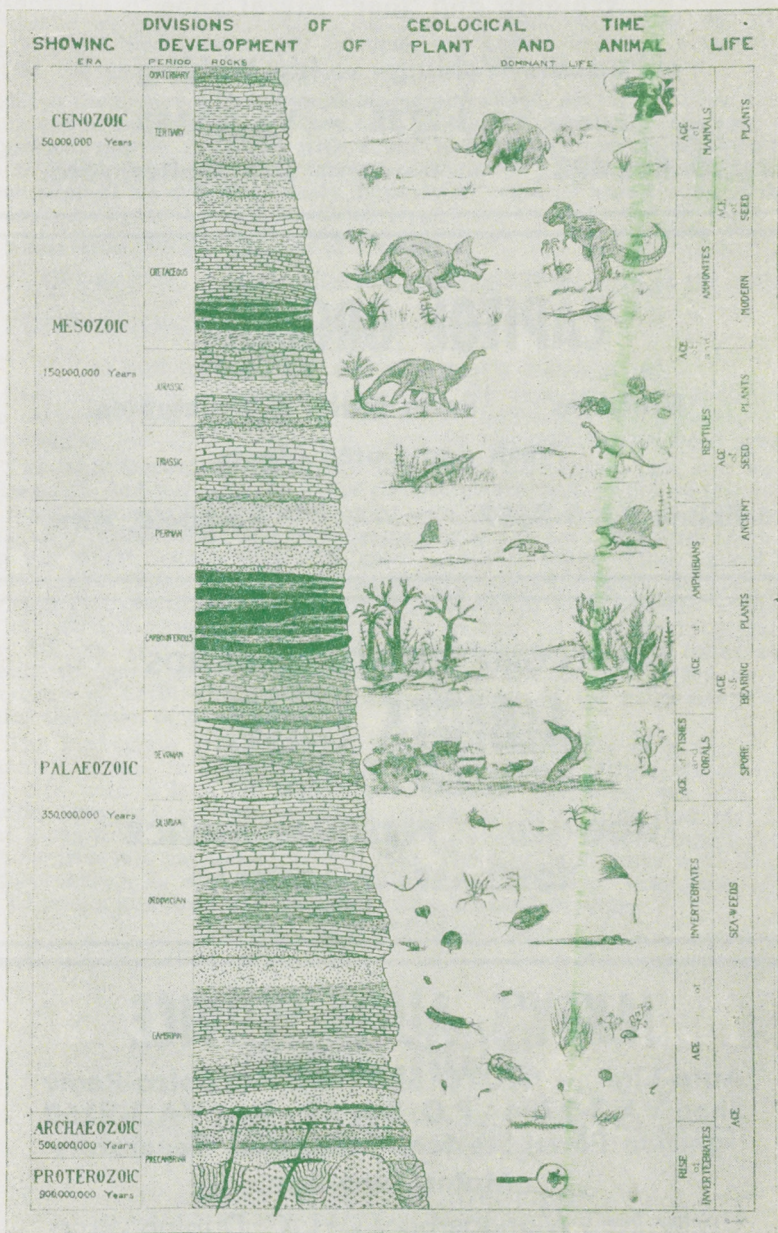
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(The Drumheller Badlands Are Part Of The Cretaceous Period)

Courtesy of The Calgary Zoological Society.

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late Cretaceous period. The forms of vegetation found with them indicate a dank, warm, moist lowlands environment. This was the western edge of the Inland Sea, with shallow, swampy, delta-like shores. It was not unlike parts of Florida today. Active volcanoes showered ash and dust over the interior from time to time.

Dinosaurs were long-tailed, and often long-necked animals. Though a few species were no larger than a cat, most of them were large, and some were gigantic. *Bronosaurus*, for example, was known to attain a length of 100 feet, but no remains of this type have been found in Alberta.

All of them were probably quite stupid and torpid. An elephant has about a nine pound brain and some four tons of body. The average Dinosaur by comparison, had to get along with a one pound brain for his whole forty tons of bulk. He was doubtless immersed whenever possible in swamps that helped support his overblown body. It no doubt required a half a ton of fodder daily to supply the appetite of the large ones.

There were two great groups of Dinosaurs:

PLANT-EATING DINOSAURS (*Ornithischia*). These were in the majority.

FLESH-EATING DINOSAURS (*Saurischia*).

FLESH-EATING OF CARNIVOROUS DINOSAURS

Five families of carnivorous dinosaurs are represented in collections from Alberta. Good skeletons of the large flesh-eaters, *Gorgosaurus* and *Alberosaurus*, and of the bird-mimic form *Struthiomimus* have been found.

The large carnivores were by far the largest flesh-eaters that ever walked the earth, and were the tyrants of the everglades. Some were 40 feet long, had huge jaws nearly 4 feet long armed with lance-shaped recurved teeth as much as 6 inches long. The jaws were hinged far back, enabling them to open the mouth with a very wide gape, like a crocodile. They walked on powerful hind limbs, and, in the upright position were nearly 20 feet tall. The hind feet carried the weight on three powerful toes, whereas a fourth toe had shifted toward the back on the foot and could assist in grasping prey. All toes were tipped with sharp recurved claws. The front limbs were ridiculously small and of little functional use. The carnivores fed on the abundance of herbivorous animals. The extinction of the plant-eaters also spelled the doom of the flesh-eaters.

The Bird-mimic Dinosaurs, of which *Struthiomimus* is an example, are so named because in general build they suggest a large, struthious (ostrich-like) bird with a long tail but without feathers. The neck was long and slender. They had no teeth, and it is not certain as to what they ate. The front limbs were long and slender, and the three long narrow fingers could have reached into cavities to extract food. The long hind limbs were adapted for running, as was the case with all true carnivores. They were 10-15 feet in length and are fairly common in the lowland deposits.

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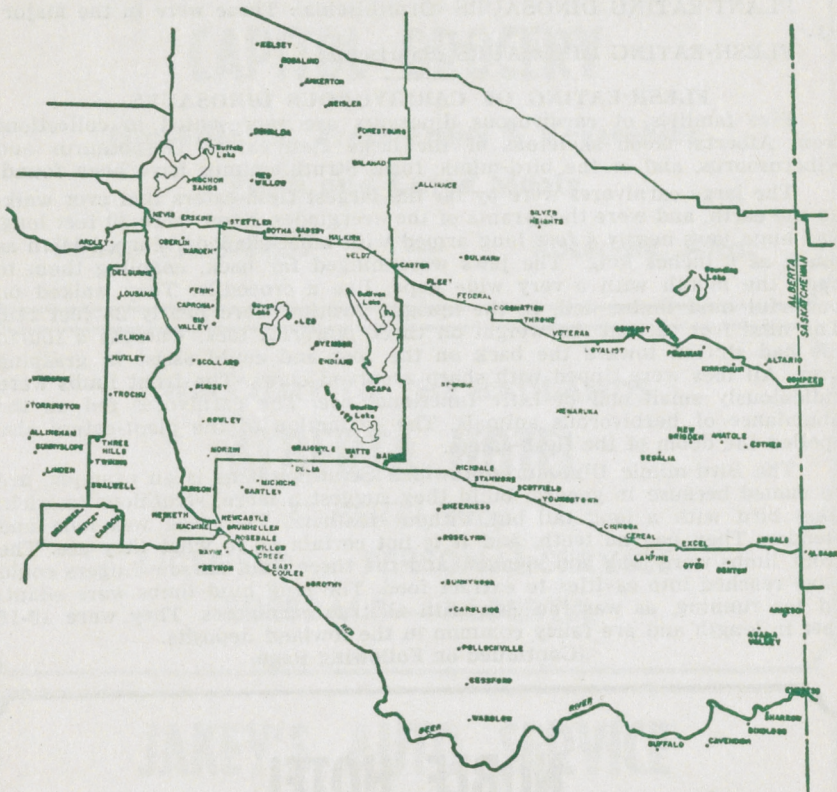
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PLANT-EATING OR HERBIVEROUS DINOSAURS

The remains of such forms were preserved abundantly in the muds that covered the Alberta lowlands in Cretaceous times. Many fine specimens have been excavated in the Drumheller area. The most plentiful forms represent the following families:

DUCK-BILL DINOSAURS.

HORNED DINOSAURS.

ARMOURED DINOSAURS.

DUCK-BILL DINOSAURS

The Duck-Billed Dinosaurs are so named because of an expanded beak, like the bill of a duck. Some of these have been found in a good state of preservation. Rapid decomposition of mud and sand in the lowlands covered the carcass before the flesh decayed, and excellent impressions of the scaly hide occur. More than a dozen species have been found in Western Canada. They belong to two sub-families, which are popularly known as flat-headed and hooded duck-bills.

They ranged in length from 12 to 40 feet, almost half of which was tail. They were mainly bipedal, and the powerful hind limbs could support them whether on dry land or wading in swamps or bayou. It is known that they were adapted for swimming because the toes of both feet were webbed. The toes terminated in hoofs, each of the three on the hind feet being as large as the hoof of a horse. The skin was thin and lack of any means of defence, coupled with the webbed feet and swimming tail, indicate that these Dinosaurs spent most of their time in the water, where they were best protected from the big carnivores.

The Duck-Bills had scissors-like teeth for chopping or slicing the plants on which they fed. These teeth numbering from 200-400 were arranged in magazines and stood in diagonal and vertical rows. As the outer edges were worn off the teeth grew out from the jaw as do the gnawing teeth of a squirrel.

The hooded Duck-Bills had developed a specialized breathing arrangement as an aid to underwater feeding. The nasal passages led to air storage chambers permitting the animal to remain under water longer, or possibly to prevent water entering the lungs while the reptile was feeding under water. These air storage chambers, derived from the facial bones extended back and upwards on the top of the head in a definite hood.

Some of the Duck-Bills have been given technical names indicating their Alberta origin, e.g., *Anatosaurus edmontoni* and *Edmontosaurus regalis*.

HORNED DINOSAURS

The Horned Dinosaurs ranged from 5 to 30 feet in length. Their most notable feature is the huge head with its "flaring collar" extending back over the neck and shoulders as a great crest. The head and crest accounted for about a third of the total length of the animal. The crest served partly for the attachment of powerful muscles and partly for protection of the neck. Projecting forward from the skull were one, two or three long, sharp nasal horns. The striking crest and horns were admirably suited for defensive purposes.

The Horned Dinosaur was habitually quadrupedal, with a heavy low slung body. The back was broad and the body very massive. The tail was short in comparison to the Duck-Bill and there is no evidence that they were swimmers. The skin was composed of scales.

It is the only reptile known with double-rooted teeth, and like the Duck-Billed forms the teeth were adapted for chopping or slicing.

(Continued on Following Page)

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ARMoured DINOSAURS

The Armoured Dinosaurs were low-set, heavy-boned, quadrupedal reptiles with short, very massive limbs and short, stubby feet. All members of the family were encased in a dermal armour of bony scutes or plates in the skin. In some the plates were high-keeled, thick and sharp, but in others they were only slightly elevated. The large plates were arranged in rows on the sides and back. The under parts of the body were covered with small shapeless bones that completely filled the skin and protected the animal like chain armour, somewhat, like the protection of the modern armadillo. In some forms the short tail terminated in a club-like mass of fused scutes. Except for size, these Dinosaurs somewhat resembled the present day desert lizards "The Horned Toad" found in the Medicine Hat and Cypress Hills area of Southern Alberta.

Some of the Canadian forms were 5 feet broad at the hips, though only 5 feet high and from 10 to 15 feet in length. The head was small, and even in a large specimen the brain cavity is smaller than a man's fist. The teeth were small and weak, but rather sharply pointed. They may have fed on tubers or soft roots.

The broad body and short powerful limbs would enable the Armoured Dinosaur to slither through swamps much as turtles do today. If caught on dry land, he could drop flat and the armour would protect him from carnivores.

(Stegosaurus, a type with spectacular high keeled plates, and which has been modelled at St. George's Island Park at Calgary has never been found in Canada).

HOW ARE DINOSAUR SPECIMENS COLLECTED?

Erosion exposes the reptile bones. Where a bone has been exposed is what a paleontologist calls a "prospect." Sometimes such a find leads only to a few vertebrae, one limb or a skull, but occasionally to a complete skeleton. It may thus require much tedious prospecting to find a complete skeleton, such as are on exhibit in our large museums. In some localities there are accumulations of bones of many Dinosaurs in a limited area. These are known as "bone-beds". Such accumulations are not suitable for museum specimens. A well exposed bone-bed occurs east of Morrin Ferry. These bone-beds may have resulted from carcasses being washed up on the shore of the ancient inland sea. They indicate that many Dinosaurs must have died at the same time.

Once a prospect is considered suitable for collection it may take several men weeks, or even months, to collect the specimen successfully. This requires much heavy manual labour under all conditions of wind, scorching sun and driving rain. The specimen is outlined by the use of hand pick, awl, small chisel and whisk broom. Often large amounts of over-burden must be removed from rough and cliff-like terrain. A certain amount of rock is always left around the bones for protection while they are being moved from the field to the laboratory. Large specimens must be divided into sections, sometimes weighing as much as a ton. When the sections are outlined they are wrapped in burlap soaked in plaster to form protective casts. These are then packed in protective cases and shipped to the laboratory, where the process is reversed, and careful preparation commenced. Small pieces are often shellaced to prevent crumbling.

In the laboratory the specimen is classed and studied. In mounting for museum exhibition the skeleton is articulated and supported by heavy metal supports. In some cases the specimen is found well articulated and the large sections are mounted as a panel, with the bones embedded in the rock in which they were found. The mounting processes again may require weeks and months of exacting labour.

(Continued On Page 60)

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INDUSTRIAL LETTER

Dear Tourists:

Re: INDUSTRIAL DRUMHELLER

Drumheller, since the turn of the 20th century has been a thriving coal mining metropolis. Drumheller has to date been chiefly an industrial town of a primary industrial nature. The economy of the district has been kept at a high standard by the coal fields, agricultural area, and more recently by the highly productive oil and natural gas fields in the immediate district.

The secondary industries presently in Drumheller consist of those industries required to maintain the coal industry and the needs of the population of the valley.

The second phase of industrial Drumheller has just come into being and will take the trend of serving the agricultural area by way of plants to process the agricultural products of the district and to supply the requirements of the agriculturists in the district.

Drumheller can be and will be in the not too distant future an Industrial mecca of Western Canada due to its God-given natural resources and exceptionally convenient location to service the Prairie Provinces and their ever increasing population. Drumheller's natural resources consist in part of coal (of the highest domestic quality), shale, bentonite clays, gravel and sand, gas and oil, and the Red Deer River which is one of the West's few remaining unpolluted water supplies.

Drumheller is an established city with all of the desirable living condition required by industries with complete Federal, Provincial and Municipal Government services of the highest standard, where both civic and provincial government welcome and assist industry.

Our transportation system leaves little to be desired as Drumheller is on the main line of the Canadian National Railways between Calgary and Saskatoon, daily return Dayliner service Drumheller to Edmonton, is serviced by the Canadian Pacific Railway and Alberta No. 9 Highway from Trans-Canada highway near Calgary to the Saskatchewan border, also Alberta Highways No. 10 and No. 56.

The telegraphic communications of both railways together with the Alberta Government Telephones, the Dinosaur Broadcasting Association and T.V. station CHCT Calgary, combined to equip Drumheller with one of the finest communication services available.

The industrialist establishing in Drumheller can feel confident that his labor force will find much satisfaction and contented living in Drumheller which has a School System next to none, medical and hospital facilities, a variety of well attended churches, lodges, service clubs, societies, recreational and cultural activities reaching far beyond any city of comparable size in the great north-west.

To the manufacturer of food products Drumheller offers an abundance of livestock, hogs, poultry, market garden products (including cantelopes, tomatoes, cucumbers, corn), grains of the highest milling and malting qualities, and a dexterous female labor force.

The citizens of Drumheller are proud of their prehistoric wonder-land and invite you to join us in work and play.

Yours very truly,
—C. L. SWAIN,
Industrial Co-ordinator for
City of Drumheller.

THE DRUMHELLER MUSEUM IS THE IDEAL PLACE TO BEGIN
YOUR TOUR OF THE DRUMHELLER BADLANDS.

WHY STUDY DINOSAURS AND OTHER FOSSILS?

Fossils provide us with a veritable "Calendar of Life." Through their study life's endless miracle parades out of the mists of time. We now know that distinctive fossils characterize different periods in earth history. Many rich fossil beds lie deep in the earth's crust, sealed from man's prying eye. Coal, oil, the limestone essential to steelmaking—all three are essentially of fossil origin. By studies of fossils where they have been exposed in rocks by erosion or vast mountainous upthrusts, the geologist is assisted in his studies of drill cores from oil wells and in mineral exploration. Thus fossil study not only reveals the past but are basic to our present industrial society.

Then too, there is the thrill of discovery, and of finding new threads in the tapestry of life. The biologist uses fossil evidence to illustrate his study of life's evolution, and for classifying plants and animals, all of which have applications to biological, medical and social problems.

Thus industrial and city planners, agricultural and military services may ascertain vital information on water and mineral resources from geological and fossil studies.

Man, being endowed with an insatiable curiosity cannot foresee that fossil study will ever be completely finished. Fossil study is truly "The Book of Ten Thousand Volumes", as certain Chinese villagers have called the earth's bedded strata.

Through the mists of superstition, men have groped toward a fuller understanding of their planet. They have found rational explanations that have helped unravel the story of the earth's formation through the ages. Through fossil study we now know that this was not the static, unchanging world some ancients thought.

WHAT KILLED THE DINOSAURS?

It is impossible to state definitely what caused the extermination of the Dinosaurs. It is also impossible to state whether a single factor was operative or a combination of many.

Perhaps the most general explanation would be that these great animals were unable to adapt themselves to changing conditions. They may have succumbed to other more progressive animals. They were cold blooded, sluggish, with a small and lowly organized brain in comparison to their bulk, which may have made it difficult for them to compete with more efficient warm blooded mammals which appeared at the end of the Cretaceous period. Small mammals could also have preyed upon their eggs.

There may have been other changing conditions in their environment such as a sudden climatic change, perhaps a flood, perhaps a suffocating blizzard of volcanic ash and gas.

It is believed that a race or order can become old and weak in the same way as an individual. This is called racial senescence. This is often accompanied by overspecialization. During the closing years of the Cretaceous period the number of species and individuals gradually became fewer, although more highly specialized and gigantic. Large, specialized forms are easily exterminated if subjected to a change in habitat or food supply.

Thus we are able to speculate along various lines of thought. But with certainty we may state that the day of the Dinosaur was over as the Cretaceous period drew to a close, and the future so far as reptiles were concerned was to belong to the relatively small animals that we know today, the lizards, snakes, turtles and crocodiles.

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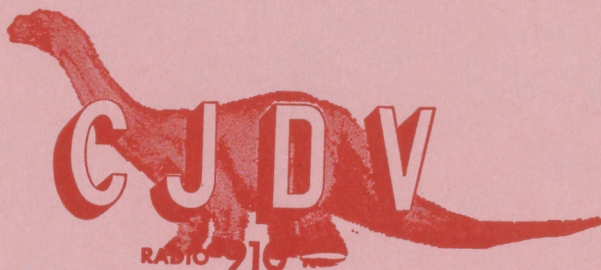
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